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DESIGNING OF MICROCONTROLLER 8051 BASED LEARNING MEDIA OF CONTROL BY USING THE MCU 8051 IDE AND C PROGRAMMING LANGUAGE WITH A C-COMPILER OF SDCC-SMALL DEVICE C COMPILER TO SUPPORT THE IMPLEMENTATION OF ACTIVE LEARNING IN HIGHER EDUCATION-ALFHE (ACTIVE LEARNING FOR HIGHER EDUCATION)

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ABSTRACT

On this occasion the author developed Microcontroller 8051 based Active Learning Media of control using 8051 microcontroller simulator MCU 8051 IDE on Windows 7 (MCU 8051 IDE can basically run on various operating systems)[3] to support the implementation of active learning in higher education. Instructional media developed in the form of a controlling simulation program in C language with SDCC compiler-Small Device C Compiler. This simulator can be downloaded freely on www.sourceforge.net[3] and SDCC can be downloaded for free as well on http://sdcc.sourceforge.net/ [7]. The developed simulator will mimic a control system consist of an input switch connected to P0.0 that imitate an input from a sensor and an alarm as an output in the form of a Virtual Common Anode Seven Segment Display that will display a character "L" or "H" in accordance with the input from the sensor; this virtual output device connected with P1 of 8051. Based on the author class observation, this simulator has been successfully enhanced the participation of the students in the learning process, allowing the author to apply his learning strategy properly and successfully overcome the lack of funds to meet the need of spending for equipments [6]. The simulation program has also been successful in reducing errors in building a real devices (reducing the costs of production).

KEYWORDS: Active Learning Media, MCU 8051 IDE, Small Device C Compiler

INTRODUCTION

Based on the author's experience in giving lectures at universities, the author saw the need for a change in teaching metedologi (Instructional Strategy of teaching) in order to increase the grade of learning success; transforming from conventional learning metedologi (teacher as a learning center or source) to the active teaching methodology (Active Learning Methodology); students as a learning center. Application of active learning strategy has shown significant efficacy compared with conventional one [1][2]. Active learning strategy has been shown to increase the participation and desire of the class (reduction in stress levels of students and teachers) in studying and significantly improve it capability in mastering a subject and eventually produce students who are more innovative; students be given the freedom to try new things by using a practical learning media such as a simulator. This strategy of implementing a simulator in teaching will reduce the production cost when they (as a group or individual) making a final project of the subject. One of the strategies of active learning is the use of instructional media in the form of props. At present there are a variety of learning simulator of 8051 microcontroller that can be downloaded for free and can then be used as a media of

learning in the implementation of active learning[3][4]. The author use the MCU 8051 IDE simulator to develop microcontroller 8051-based control props that runs on Windows 7 operating system. The C language, SDCC-Small Device C Compiler and the virtual hardwares provided by the MCU 8051 IDE simulator were used in developing this learning media. The virtual output hardware displayed the output of the program according to the data input on the virtual input device; according to the C program that is built on the virtual props of course. The author hopes that this simulator will contribute to the development of science, particularly in the field of microcontroller and computer based control study and also can be implemented as an active learning media in higher education. Hopefully it can also inspire teachers or lecturer to create a variety of other props by utilizing the MCU 8051 IDE and C programming.

MAIN

Figure 1 below shows the print screen of the GUI (Graphical User Interface) in the form of two virtual hardwares (port 0 as an input port and port 1 as an output port). Port 0 (P0) connected with a structure of simple switches (A-H). Each pin on the switch P0 (P0.0-P0.7) are independent and are toggle switch, when the switch is pressed, the switch will be connected to GND and if pressed again then the corresponding switch will open (logic "1"). In this article only one switch labelled “A” (P0.0) was used to simulate an input from a sensor or a transducer. As mentioned before the output of the simulator is in the form of a Virtual Common Anode Seven Segment Display (Anode lead or terminal of each segment are connected together to a 5 V DC voltage source, and the cathode legs of the virtual display segments (a segment – dot segment) are connected to P1.0-P1.7 of 8051 consecutively. Each segment will light up if the cathode leg of a virtual Seven Segment Display is connected to GND or given a logic "0"). The Virtual Seven Segment Display is used only to display the two character (“H” and “L”) alternatively. The character "H" will be displayed when the input logic from the sensor (P0.0-switch labeled "A") is a logic "1" but character "L" will be displayed when the input logic from the sensor is a logic “0”. To display "H" on the virtual display P1 must be set to 0x89 (P1=0x89) see Figure 1 as shown in the instructions below. In contrast to display the character "L" P1 must be set to 0xc7 (P1=0xc7) see Figure 2 below.

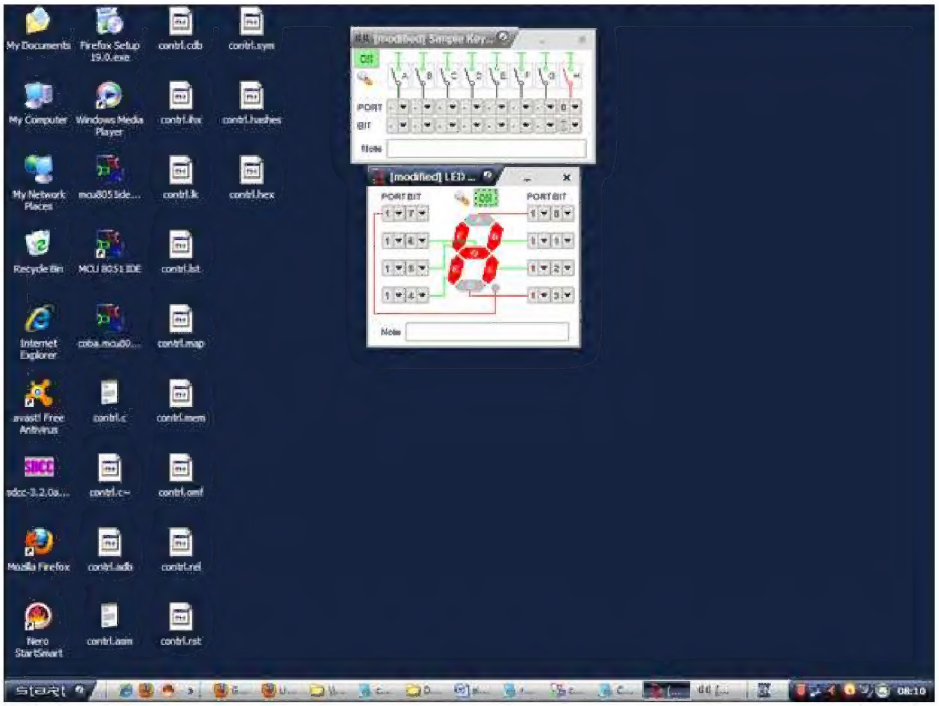

Figure 1: Print Screen GUI, Displaying “H” Character

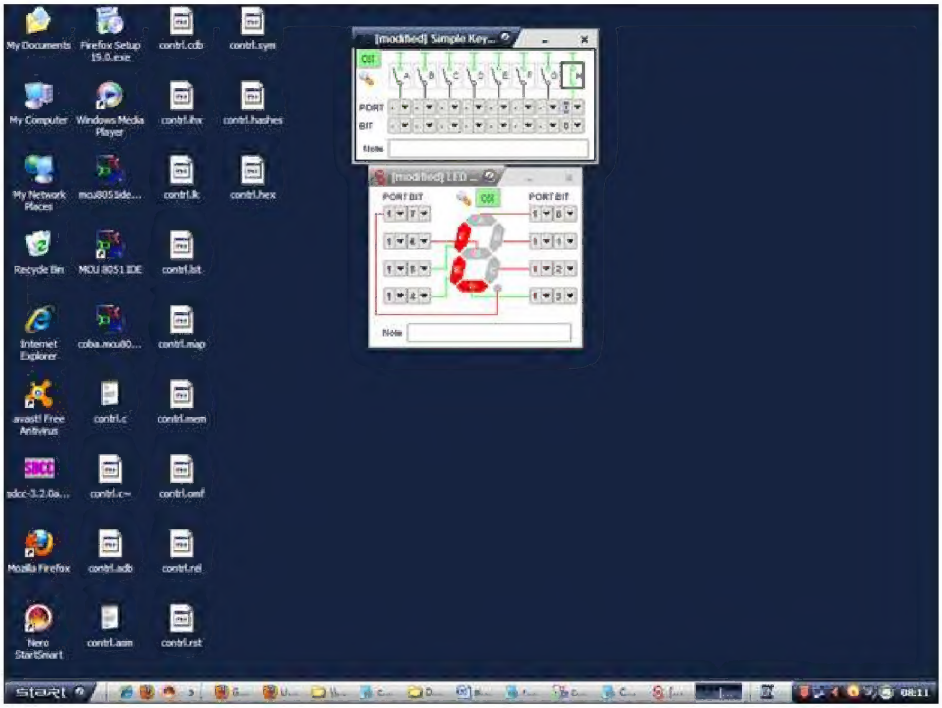

Figure 2: Print Screen GUI, Displaying "L" Character

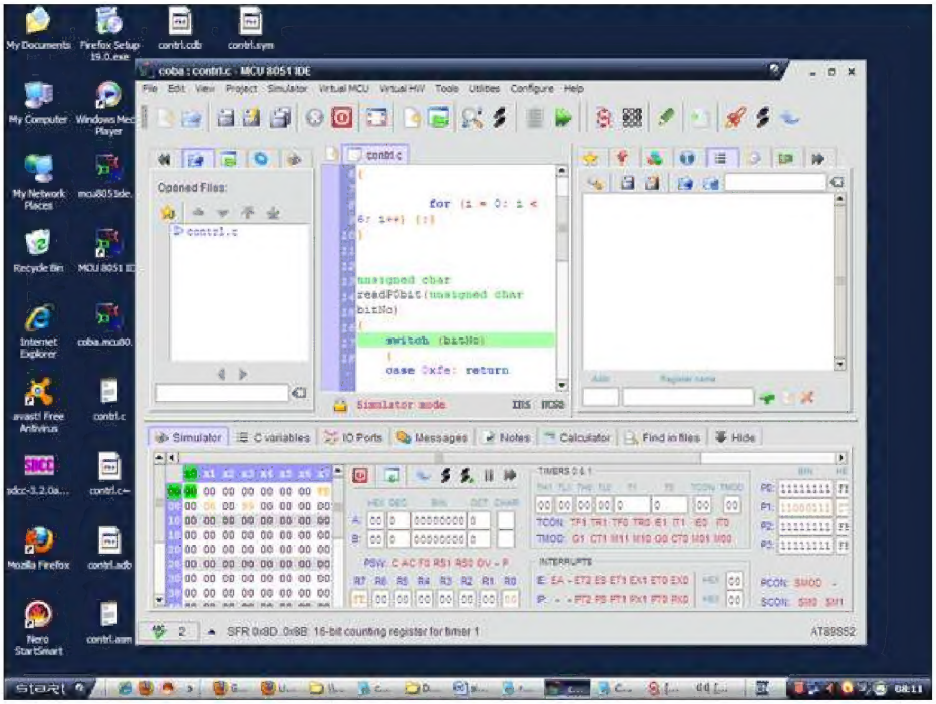

Figure 3: Print Screen GUI, Program of Controlling Simulator

To read input from a sensor connected to P0.0 see Figure 1 and 2 instruction j = P0 and subroutine readP0bit (j) are used. Subroutine readP0bit (j) will examine the logic of the bit 0 of P0 (P0.0), If the input logic read at P0.0 is "0" then the data read at P0 is 0xfe and P1 will be set to 0xc7 that will display the character L (Low) on the virtual seven segment

display. However, if the input logic read at P0.0 is "1" then the data read at P0 is 0xff and P1 will be set to 0x89 and characters “H” will be displayed on the virtual seven segment display.

Figure 3 above shows the 8051 GUI IDE used to build the simulator program built using the C programming language of SDCC compiler. The program of the simulator is shown in the program below.

```
#include <at89x51.h>
unsigned char i;
void delay()
{
   for (i = 0; i < 6; i++) {;}
}
unsigned char readP0bit(unsigned char bit No)
{
  switch(bit No)
 {
  case 0xfe: return P1=0xc7;
  break;
  case 0xff: return P1=0x89;
   break;
  default: return 0;
   break;
   }
}
main()
{
  while(1==1)
 {
  unsigned char j;
j=P0;
read P0bit(j);
delay;
```

```
}

}
```

From the results of simulation program testing and its implementation in the class a few thing can be obsered,

- Program runs as planned and is stable
- The student can run the simulator immediately
- The student can immediately modify the program according to their needs or ideas that emerged in each group of study.

CONCLUSIONS

This paper is expected to contribute to science, particularly in the fields of microcontroller, computer, and control. And can be used as a media of learning in an active learning class in higher education. Hopefully it will facilitate the student to master the learning materials and the teacher/lecturer can run the class much better.

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